WHAT IS CLAIMED IS:

1. A solid freeform fabrication method of forming a three-dimensional object in a plurality of layers from a build material by exposing the layers to a prescribed stimulation, the method comprising:

determining a general build style for the object comprising a plurality of parameters;

providing data representing the three-dimensional object to be formed;

orienting the data in accordance with a Z-axis to establish a complete span of Z-values for the data;

identifying at least one special build type for at least one range of Z-values of the data of the three-dimensional object, the special build type comprising at least one alternative parameter;

forming the layer of the build material according to at least one of the alternative parameters from the special build type for layers being formed within the range of Z-values and according to at least one of the parameters from the general build style for all other layers being formed in the span of Z-values;

exposing the layer of build material to the prescribed stimulation according to at least one of the alternative parameters from the special build type for layers being formed within the range of Z-values and according to at least one of the parameters from the general build style for all other layers being formed in the span of Z-values; and,

repeating the steps of forming and exposing the layers in order to form the three-dimensional object.

2. The method of claim 1 wherein the plurality of parameters of the general build style and the alternative parameters of the special build types are selected from any combination of re-coating parameters, exposure parameters, or support parameters.

3. The method of claim 1 wherein the plurality of parameters of the general build style and the alternative parameters of the special build types are selected from any combination of a group of parameters, the group of parameters consisting of the following parameter types: 1) layer thickness, 2) X&Y shrinkage compensation, 3) Z shrinkage compensation, 4) border overcure, 5) hatch overcure, 6) hatch type, 7) hatch spacing, 8) staggered weave, 9) alternate sequencing, 10) retraction: start, 11) retraction: end, 12) fill cure depth, 13) fill type, 14) fill spacing, 15) beam compensation on/off, 16) beam compensation value, 17) auto Z-correct, 18) additional boundaries, 19) multiple boundary offset, 20) Z-level wait, 21) pre-dip delay, 22) Z-dip velocity, 23) Z-dip distance, 24) number of sweeps, 25) gap percent, 26) sweep velocity, 27) support type, 28) minimum spacing between supports, 29) gusset angle, and 30) support height.

4. The method of claim 1 wherein the data representing the three-dimensional object is analyzed by a computer control system programmed to identify the special build type and the range of Z-values.

5. The method of claim 4 further comprising the step of slicing the data representing the three-dimensional object to be formed in a plurality of planes generally perpendicular to the Z-axis utilizing at least one of the parameters of the general build style to establish sliced object data, the step of slicing being accomplished by the computer control system.

6. The method of claim 4 wherein the computer control system determines the value of the alternative parameter of the special build type.

7. The method of claim 6 wherein the computer control system calculates the value

of the alternative parameter of the special build type according to a linear relationship, a exponential relationship, or a logarithmic relationship.

8. The method of claim 4 wherein the alternative parameters of the special build types are selected from a library of special build types by the computer control system, the special build types being associated with at least one special geometric condition.

9. The method of claim 8 wherein the library of special build types comprises at least one parameter set, the parameter set being associated with the special geometric condition, the special geometric condition being either:

a trapped volume type;

a near flat down-facing surface type;

a large flat up-facing surface type; or

a delicate feature type.

10. The method of claim 9 wherein the library of special build types comprises at least one parameter set for the trapped volume type, at least one parameter set for the near flat down-facing surface type, at least one parameter set for the large flat area type, and at least one parameter set for the delicate feature type, and wherein at least one of all of the parameter sets are associated with the general build style.

11. The method of claim 8 wherein more than one special build type is identified within a range of Z-values of the span of Z-values associated with the data representing the three-dimensional object by the computer control system.

12. The method of claim 11 further comprises the steps of:

comparing the parameter sets of the special build types identified within the

same range of Z-values to determine, when present, at least two conflicting parameters among the parameter sets;

selecting a most conservative value among the conflicting parameters and assigning the most conservative value selected to a composite special build type for the same range of Z-values in which the special build types are present, the most conservative value being the value selected that would take the longest time to form the three-dimensional object; and,

forming the layers of build material within the range of Z-values and exposing the layers of build material within the range of Z-values to the prescribed stimulation, wherein at least one of the parameters from the composite special build type is utilized in either forming or exposing the layers of build material within the range of Z-values.

13. The method of claim 11 wherein a parameter set is associated with each special build type identified within the same range of Z-values, the method further comprises the step of:

comparing the special build types identified within the same range of Z-values with a special build type hierarchy;

selecting the parameter set from one of the at least two or more special build types within the same range of Z-values having the highest priority according to the special build type hierarchy;

assigning the parameter set selected to the same range of Z-values in which the at least two or more special build types are present; and

forming the layers of build material within the range of Z-values and exposing the layers of material within the range of Z-values to the prescribed stimulation, wherein at least one of the parameters from the parameter set selected according to the special build type hierarchy is utilized in either forming or exposing the layers of build material

within the range of Z-values.

14. The method of claim 11 wherein a parameter set is associated with each special build type identified within the range of Z-values, the method further comprises the steps of:

comparing the alternative parameters of the parameter sets of the two or more special build types identified within the same range of Z-values with the plurality of parameters of the general build style to determine the presence of corresponding parameters for each parameter set, the corresponding parameters being of a same parameter type present in the general build style;

comparing the corresponding parameters for each parameter set to a special parameter hierarchy in order to determine a highest priority parameter change of one of the corresponding parameters;

selecting the parameter set from the special build type for the range of Z-values of the corresponding parameter determined to have the highest priority parameter change; and

forming the layers of build material within the range of Z-values and exposing the layers of build material within the range of Z-values to the prescribed stimulation, wherein at least one of the parameters from the parameter set selected having the highest priority parameter change is utilized in either forming or exposing the layers of build material within the range of Z-values.

15. The method of claim 14 wherein in the event the highest parameter change of the two or more parameter sets are the same, selecting the parameter set whose highest parameter change has a more conservative value among the parameter sets, the more conservative value being the value selected that would take the longest time to form the three-dimensional object.

16. The method of claim 14 wherein in the event the highest parameter change of the two or more parameter sets are the same, selecting the parameter set having a greater magnitude change in the value of the highest priority parameter change compared to the value of the same parameter type present in the general build style.

17. The method of claim 16 wherein in the event that the magnitude change in the value of the highest priority parameter change of the parameter sets are the same, repeating all of the steps with a next highest parameter change for each parameter set until one of the parameter sets is selected.

18. A solid freeform fabrication apparatus for forming a three-dimensional object from a plurality of layers from a build material by exposing the layers to a prescribed stimulation, comprising:

a memory for storing a general build style having a plurality of parameters;

a memory for receiving data representing the three-dimensional object;

a computer control system programmed to:

a) process the general build style from the memory for storing the general build style;

b) process the data representing the three-dimensional object from the memory for receiving data;

c) orient the data representing the three-dimensional object in accordance with a Z-axis;

d) establish a span of Z-values for the data representing the three-dimensional object along the Z-axis;

e) identify at least one special build type comprising at least one alternative parameter within a range of Z-values of the span of Z-values associated

with the data representing the three-dimensional object; and

f) produce object formation data;

a coating system for forming a layer of the build material according to at least one of the alternative parameters from the special build type for the layers being formed within the range of Z-values and according to at least one of the parameters from the general build style for all other layers being formed;

an exposure system for selectively applying the prescribed stimulation to the layer according to at least one of the alternative parameters from the special build type for the layers being formed within the range of Z-values and according to at least one of the parameters from the general build style for all other layers being formed; and

a controller programmed to receive the object formation data from the computer control system in order to operate the coating system and the exposure system to form the layers of the three-dimensional object.

19. The apparatus of claim 18 wherein the computer control system determines the value of the alternative parameter of the special build style.

20. The apparatus of claim 19 wherein the computer control system calculates the value of the alternative parameter of the special build type according to a linear relationship, an exponential relationship, or a logarithmic relationship.

21. The apparatus of claim 18 wherein the computer control system is further programmed to slice the data representing the three-dimensional object to be formed in a plurality of planes generally perpendicular to the Z-axis utilizing at least one of the parameters of the general build style to establish sliced object data

22. The apparatus of claim 18 further comprising:

a memory for storing a library of special build types wherein the computer control system selects the alternative parameters of the special build types from the library of special build types, the special build types being associated with at least one special geometric condition.

23. The apparatus of claim 22 wherein the library of special build types comprises at least one parameter set comprising the alternative parameter, the parameter set being associated with the special geometric condition, the special geometric condition being either:

a trapped volume type;

a near flat down-facing surface type;

a large flat up-facing surface type; or

a delicate feature type.

24. The apparatus of claim 23 wherein the memory for storing the general build style, the memory for receiving the data representing the three-dimensional object, and the memory for storing the library of special build types are part of the computer control system.

25. The apparatus of claim 23 wherein at least one of the parameter sets is associated with the trapped volume type, the near flat down-facing surface type, the large flat up-facing surface type, and the delicate feature type, wherein at least one of all of the parameter sets is associated with the general build style.

26. The apparatus of claim 18 wherein the computer control system is further programmed to identify more than one special build type within the range of Z-values of the data of the span of Z-values associated with the data representing the three-

dimensional object.

27. The apparatus of claim 26 further comprising:

a memory for storing a plurality of parameter sets wherein at least one parameter set is associated with each of the more than one special build types identified within the same range of Z-values by the computer control system, wherein

the computer control system is further programmed to:

a) compare the parameter sets of the special build types identified within the same range of Z-values to determine, when present, at least two conflicting parameters among the parameter sets;

b) select a most conservative value among the conflicting parameters and assign the most conservative value selected to a composite special build type for the same range of Z-values in which the special build types are present, the most conservative value being the value selected that would take the longest time to form the three-dimensional object; and,

c) produce the object formation data for the controller to:

1) operate the coating system to form the layers of build material within the same range of Z-values;

2) operate the exposing system to expose the layers of build material within the same range of Z-values to the prescribed stimulation; and

wherein at least one of the parameters from the composite special build type is utilized in either forming or exposing the layers of build material within the same range of Z-values.

28. The apparatus of claim 26 further comprising:

a memory for storing a plurality of parameter sets wherein at least one parameter

set is associated with each of the more than one special build types identified within the same range of Z-values by the computer control system, wherein

the computer control system is further programmed to:

a) compare the special build types identified within the same range of Z-values with a special build type hierarchy;

b) select the parameter set from one of the at least two or more special build types within the same range of Z-values having the highest priority according to the special build type hierarchy;

c) assign the parameter set selected to the same range of Z-values in which the at least two or more special build types are present; and

d) produce the object formation data for the controller to:

1) operate the coating system to form the layers of build material within the same range of Z-values;

2) operate the exposing system to expose the layers of build material within the same range of Z-values to the prescribed stimulation; and

wherein at least one of the parameters from the parameter set selected according to the special build type hierarchy is utilized in either forming or exposing the layers of build material within the range of Z-values.

29. The apparatus of claim 26 further comprising:

a memory for storing a plurality of parameter sets wherein at least one parameter set is associated with each of the more than one special build types identified within the same range of Z-values by the computer control system, wherein

the computer control system is further programmed to:

a) compare the alternative parameters of the parameter sets of the two or more special build types identified within the same range of Z-values

with the plurality of parameters of the general build style to determine the presence of corresponding parameters for each parameter set, the corresponding parameters being of a same parameter type present in the general build style;

b) compare the corresponding parameters for each parameter set to a special parameter hierarchy in order to determine a highest priority parameter change of one of the corresponding parameters;

c) select the parameter set from the special build type for the range of Z-values of the corresponding parameter determined to have the highest priority parameter change; and

d) produce the object formation data for the controller to:

1) operate the coating system to form the layers of build material within the same range of Z-values;

2) operate the exposing system to expose the layers of build material within the same range of Z-values to the prescribed stimulation; and

wherein at least one of the parameters from the parameter set selected having the highest priority parameter change is utilized in either forming or exposing the layers of build material within the range of Z-values.